

REMARKS

In order to expedite the prosecution of this application, claims 1-7 of the PCT application as originally filed have been canceled without prejudice or disclaimer of subject matter thereof. New claims 8-27 have been added to more definitely point out and distinctly claim the subject matter which applicant regards as the invention.

The Applicant appreciates the courteous and complete examination of the application by the Examiner, and appreciates the acceptance of this preliminary amendment. Should the Examiner feel that there are further issues which might be resolved by means of telephone interview, he is cordially invited to telephone the undersigned at 727-345-1450.

Respectfully Submitted,




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On (Date) 7/6/2005 by David A. Guerra 

**A Composite Sandwiched Wall Board RECONSTRUCTABLE LAMINATED
WALL PANEL**

TECHNICAL FIELD

The invention is a ~~light-weight wall partition panel / system in the construction business in the field of building construction and relates particularly to a light-weight modular panel system.~~

BACKGROUND OF THE INVENTION

~~It is common sense that the traditional wall construction was done in brick/ block. But the manufacturing of the red blocks or concrete block is consuming great quantity of clay soil and energy. In addition, the burning and manufacture of red blocks is prohibited as it is highly energy inefficient and contaminate our natural environment. The subsequent replacement is the light-weight cement block or board, internal hollow cement wall panel or gypsum board stud wall with the following deficiencies: Historically, walls have been constructed from bricks or blocks. The manufacturing of red brick and concrete blocks consumes a great quantity of clay soil and energy. In addition, the baking and manufacturing of red bricks is prohibited in many locations as it is highly energy inefficient and contaminates the environment. The subsequent replacement materials have been lightweight cement block or board, internal hollow cement wall panels and gypsum board stud walls. These materials, however, have the following deficiencies:~~

- ~~1. Unable to carry heavy domestic objects, such as bookshelf, cabinet and air conditioner etc. Special arrangement to the wall panel is required in order to carry such heavy objects. Thus, flexibility to the~~

~~hanging object after installation is not available.~~ They are unable to support heavy domestic objects, such as bookshelves, cabinets, and air conditioners etc. Special fixtures to the wall panel are required in order to support such heavy objects.

2. ~~There are no perfect panel joints in any dry wall or concrete block wall systems. As the panel is usually jointed in different compound or even adhesive tape, temperature variation would cause panel joint separation again. Plaster covering the crack again is unavoidable and adding cost to the wall panel refurbishment. The panel joints in dry wall and concrete block wall systems are imperfect. As the panel is usually joined using a different compound or even adhesive tape, even slight temperature variations cause panel joint separation again and damage to the joint material. Plastering of such cracks is an unavoidable cost and such walls require constant maintenance and repair.~~
3. ~~Under the condition of the imperfect joint completion or cracking problem as mentioned above in hollow cement wall panels, it is easy to become the "home" of different household insects and other unwelcome living organism and storage of waste!~~ Uneven or imperfect joints or cracking problems as mentioned above in hollow cement wall panels results in a network of cracks, fissures and small spaces. These spaces become home to various household insects and other unwelcome living organisms and waste material.
4. Hollow and lightweight partitions do not provide good sound nor heat insulation. Such partitioning systems require further modification

(such as installing insulation) to resolve these issues which adds construction time and cost to each job.

CN-Y-2440872, for example, discloses a fiberglass mesh shell 2 reinforced with cement and sand which completely surrounds a polystyrene core 3. The shell 2 is continuous and also forms the tongue and groove 4 component of the panel. The single shell design of CN-Y-2440872 restricts the flexibility of customization as a modular wall panel system in the field, and the tongue and groove system with beveled edges is structurally weak.

CN-Y-2510558 discloses a fire resistant paneling which is added or retrofit to existing walls as insulation. It is thin, and has no structural value. A principal design feature is a plurality of transverse holes filled with a sand and cement mixture designed to disperse heat. CN-Y-2510558 discloses no means of interlocking or attaching the panels.

CN-A-1288991 is a complex panel designed as an insulating panel. It does not have tongue and groove joints or any other method of interlocking with other panels, and is designed to be glued or hung on existing walls for sound insulation or decoration.

There is therefore a need for a modular panel with an improved method and apparatus for attachment to other panels and the ceiling and floor to form a load bearing wall and provide the advantages being a lightweight wall panel system for installation, being strong enough to carry heavy objects, being easy to install, and having components which are environmentally friendly.

SUMMARY OF THE INVENTION

~~The aim of the invention, the Reconstructable Wall Panel is to resolve the above problems and able to supply a light weight wall panel system that is strong enough to carry heavy objects, easy to install and friendly to the environment.~~

~~Aforementioned invention is invented in this way. The Reconstructable Wall Panel is designed that the central layer is composed of at least no less than two pieces of modified gypsum or sand and cement with fiber glass mesh installed inside and at least no less than one piece of polystyrene foam board in between. Its front layer and bottom layers are designed with fine sand gypsum or sand and cement boards with glass fiber mesh inside as well.~~

~~—— This invention, the Reconstructable Wall Panel has the following superiorities as compared to the present market wall panels:~~

~~1. —— Light weight and easy to install:~~

~~The weight of the invented Reconstructable Wall Panel (Internal and External) is no more than 40 to 50 kg per m². Installation requires two workers only.~~

~~2. —— Able to carry heavy objects:~~

~~—— By using the general wall hanger in the market, the wall system could carry all kinds of domestic heavy objects.~~

~~3. —— 'Reconstructable' to become a single partition panel:~~

~~Pieces of Reconstructable wall panels are jointed by means of the extended fiberglass mesh and homogeneous joint compound. The fiberglass mesh provides a structural link between individual panels~~

~~and reinforces the joint compound to ensure no contraction and crack-free situation like a complete single wall panel.~~

~~4. No finishing plaster is needed after installation:~~

~~As the surfaces of the wall panel are flat and smooth, while the panel material and the joint mortar are homogeneous single material, the finish surface of the wall panel only require a simple skim coat of plaster before paint and wall paper application.~~

~~5. Sound Insulation:~~

~~As the Reconstructable Wall Panel is designed with gypsum and polystyrene boards, which are good sound insulating materials, and the design of tongue and groove joint reinforcement, the panel is a good separation of noise as compared with other wall panel system in the same thickness.~~

~~6. Thermal Insulation:~~

~~Besides sound insulating, both gypsum and polystyrene boards are also good heat insulator. The combination of both heat insulating materials in this panel provides the best thermal separation.~~

~~7. Fire Separation:~~

~~Both sides of the Reconstructable Wall panels are designed with modified gypsum or cement, which are materials for fire separation, the invented panel can provide 1hr. or 2 hr. fire separation.~~

The present invention, entitled the Reconstructable Laminated Wall Panel, discloses a modular wall panel system. The wall panel is comprised of at least two layers of structural gypsum board centrally reinforced with a fiberglass mesh, and at least one polystyrene board laminated together into a complete panel.

The gypsum/fiberglass mesh composite layers form the outer faces of the wall panel. The fiberglass reinforced layer may also be composed of a mix of sand, cement and/or gypsum (hydrated calcium sulfate).

Advantageously, the fiberglass reinforced layer may include 0.5%-0.3% methylcellulose ether and 0.5%-1.5% redispersable powder, and fine sand with a grain diameter between 0.25mm and 1.5mm. The fiberglass reinforced layer is optimally 8mm-12mm thick. The fiberglass mesh eyelet size is optimally 3mm² – 5mm².

An additional important feature of the wall panel system is that a fiberglass mesh extends beyond all four of the wall panel edges in both the front and back surface layers. The fiberglass mesh optimally extends between 30mm and 60mm on the top and bottom edges of a standing wall panel, and 15mm to 35mm on the side edges.

In a variation, depending on requirements such as sound insulation, fire rating and thermal insulation, the wall panel may be fabricated into three or more layers of wall panels.

During assembly, utilizing the extended mesh and tongue and groove arrangement, the panels are attached to each other in a seamless wall system without the requirement of being mechanically fixed onto the supporting structure.

Further advantages of the wall system are that the panels form walls which are lightweight, easy to install, capable of carrying heavy objects at any location, impact resistant, resistant to cracking, ready to use without plastering or further finishing, sound insulating, heat insulating and fire rated. The Reconstructable

Laminated Wall Panel system is suitable for use in indoor and outdoor applications.

BRIEF DESCRIPTION OF DRAWING THE DRAWINGS

~~Diagram 1—Simple Reconstructable Wall Panel Sectional Diagram~~

~~Diagram 2—Applied Reconstructable Wall Panel Sectional Diagram~~

The apparatus and method of the present invention will now be described with reference to the accompanying drawing figures, in which:

Figure 1 is a simple modular wall panel sectional diagram according to the invention.

Figure 2 is an applied modular wall panel sectional diagram according to the invention.

STANDARD SPECIFICATION DETAILED DESCRIPTION AND PREFERRED EMBODIMENT

~~The invented reconstructable wall panel has a standard length of 2700 mm and varies to 3000 mm while the width is 600 mm. The general thickness are 75mm and 100 mm but the overall size could be adjusted and manufacture according to requirement.~~

~~Manufacturing of the invented reconstructable wall panel is as follows: fine sand modified gypsum or sand and cement mortar is mixed and pour into a mould of required size. The fiber glass mesh is added inside forming a fine sand modified gypsum or sand and cement panel with fiber glass mesh extended beyond the limit of the panel at all sides. The pre-cut polystyrene board is added~~

~~in between the pre-described manufactured panel layer and form into a three layer reconstructable wall panel. For five-layer or more-layer reconstructable wall panels, they could be formed according to aforementioned production procedures.~~

~~Attached Drawing: as in sectional diagram 1 & 2:~~

- ~~—— 1 is fiberglass mesh~~
- ~~—— 2 is modified fine sand gypsum or cement sand board~~
- ~~—— 3 is polystyrene panels~~
- ~~—— 4 is joint grove~~
- ~~—— 5 is joint tongue~~

~~Before the production of the aforementioned standard specification, the following pre-arrangement could be implied:~~

~~The fine sand in the modified gypsum or sand inside the cement panel with fiber glass mesh inside layer is at granular size of 0.25 ~ 1.5mm. The ratio (by weight) is 10% ~ 30%. Sand with bigger size would destroy the brightness of the panel surface while the smaller size could not keep up the strength of the panel.~~

~~—— The fiber glass mesh install inside the fine sand modified gypsum or sand and cement layer is at the thickness of 8mm ~ 12mm. The mesh eyelet is from 3mm x 3mm to 5mm x 5mm. The mesh eyelet at bigger size would reduce the mesh flexibility while mesh eyelet at smaller size would affect the reinforcement of the joint.~~

~~—— The fiber glass mesh installed inside the fine sand modified gypsum or sand and cement layer is extended outside the panel at 15mm ~ 35mm at left and~~

~~right side and 30mm – 60mm at top and bottom of the panel. The reinforcement of the mesh could strengthen the panel joint without any crack.~~

~~—— The fine sand modified gypsum or sand and cement with fiber glass mesh inside laminated panel could be added 0.15% – 0.3% methycellulose ether and 0.5% – 1.5% redispersable powder. The redispersable powder could be the mixture of vinyl acetate/ ethylene copolymer or ethylene/ vinyl laurate/ vinyl chloride terpolymer. This addition could improve the flexural and shear strength and reinforcement of the panel.~~

~~—— The manufacturing of the Internal Reconstructable Wall panel into 5 layers is the best standard. The front and bottom layer and the 3rd layer in between are fine sand modified gypsum or sand and cement with fiber glass mesh inside while the 2nd and the 4th layers are polystyrene foam boards.~~

The aim of the present invention is to resolve the above problems by supplying a light-weight, modular wall panel system 10 that is strong enough to carry or support heavy objects, easy to install and environmentally friendly. The present other wall system do not allow the flexibility of attaching hanging or fixed objects to the walls in a simple manner after installation.

The Reconstructable Laminated Wall Panel System 10 is designed that the central layer or structural layer is comprised of at least one piece of modified gypsum or sand and cement with a fiberglass mesh installed inside and at least one piece of insulating materials, such as polystyrene foam board 3, in between the structural layers. The front and bottom layers include fine sand gypsum or sand and cement boards 2 with fiberglass mesh 1 inside as well.

This invention, the Reconstructable Laminated Wall Panel 10 has the following advantages over the present commercially available wall panels:

1. The panels are light-weight and easy to install. The weight of the Reconstructable Laminated Wall Panels 10 (Internal and External) is no more than 40 to 50 kg per m². Installation is easily performed by two workers.
2. The panels are able to carry or support heavy objects. Any commercially available wall hanger may be used, enabling, the wall system to support all kinds of heavy objects.
3. The panels are modular, and are easily constructed or assembled together to become a single partition wall or panel. Individual wall panels are joined by means of the fiberglass mesh 1 which extends beyond the edges of the panel and a homogeneous joint compound is added. The fiberglass mesh 1 provides a structural link between individual panels and reinforces the joint compound and ensures that there is no contraction or expansion of the joint and maintains the wall in a crack-free state as with complete walls not comprised of individual panels.
4. No finishing plaster is required after installation. As the surfaces of the wall panel are flat and smooth, and the panel material and the joint mortar are homogeneous single material, the finished surface of the wall panel only requires a simple skim coat of plaster before paint and wall paper application.
5. Sound Insulation:

As the Reconstructable Laminated Wall Panel 10 is comprised of gypsum and insulating materials, such as polystyrene boards 3, which are good sound insulating materials, and the tongue 5 and grove 4 joint fits snugly and supports and reinforces adjacent panels, the panels form an effective noise barrier compared with other walls of comparable thickness.

6. Thermal Insulation:

In addition to providing good sound insulation, both gypsum and polystyrene boards provide effective heat insulation. The combination of the two heat insulating materials in this panel provides excellent thermal separation.

7. Fire Retardation:

Both sides of the Reconstructable Laminated Wall panels include modified gypsum or cement which are materials for fire retardation. As a result, the panel provides 1-2 hours of fire retardation.

The present invention, a modular wall panel, has an optimal height of 2480 mm, but may vary from very small to 3000 mm. The optimal width is 600 mm, but this may vary. The optimal thicknesses are 60 mm, 75 mm and 100 mm, but the overall size used varies according to specific functional requirements of particular buildings.

The modular, pre-built wall panels are manufactured as follows: fine sand modified gypsum or sand and cement mortar is mixed and poured into a mould of the selected size. The fiberglass mesh 1 is added in the mix forming fine sand modified gypsum or sand and cement panel with a fiberglass mesh 1 extending beyond the limit or edges of the panel on all sides. The pre-cut polystyrene board 3 is added in between the above-described manufactured panel layer and

formed into a three layer modular wall panel. Five-layer or more-layered modular wall panels are formed according to aforementioned production procedures.

The reference numbers for the attached Figures 1 and 2 are as follows:

1 fiberglass mesh

2 modified fine sand gypsum or cement sand board

3 polystyrene panels

4 joint grove

5 joint tongue

The following materials are employed for the manufacture of the modular wall panels:

The fine sand in the modified gypsum or sand inside the cement panel with fiberglass mesh 1 inside layer optimally has a granular size of 0.25 – 1.5 mm. The ratio (by weight) is 10% - 30%. Sand of a bigger size would destroy the brightness of the panel surface while smaller sizes are not suitable for maintaining the strength of the panel.

The fiberglass mesh 1 installed inside the fine sand modified gypsum or sand and cement layer 2 is optimally 8mm – 12mm thick. The fiberglass mesh eyelet size is optimally between from 3mm x 3mm to 5mm x 5mm. Mesh eyelets of a bigger size would reduce the tension strength while mesh eyelets of a smaller size would affect the perfect infilling of materials to the eyelets and have the strength of the joint and panel.

The fiberglass mesh 1 installed inside the fine sand modified gypsum or sand and cement layer 2 extends outside the panel by, optimally, 15mm – 35mm on the left and right sides, and 30mm – 60mm from the top and bottom of the

panel. The reinforcing which the mesh provides strengthens the panel joint and ensures that there is no cracking.

The fine sand modified gypsum or sand and cement with fiberglass mesh 1 inside laminated pane could include, in a variation, 0.15% - 0.3% methylcellulose ether and 0.5% - 1.5% redispersable powder. The redispersable powder is optionally a mixture of vinyl acetate/ethylene copolymer or ethylene/ vinyl laurate/ vinyl chloride terpolymer. This addition improves the flexural and shear strength and reinforces the wall.

The manufacture of the internal modular wall panel into five layers is the preferred embodiment. The front and back or outside layers and the third or middle layer in-between are fine sand modified gypsum or sand and cement with fiberglass mesh 1 inside, while the second and the fourth layers are polystyrene foam boards 3.

As will be apparent to those skilled in the art in light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

Abstract

~~The present invention relates to a composite sandwich wall panel comprising: at least two fine sand gypsum or concrete panels (1) in each of which a glass fiber web (2) is disposed at center, and at least one polystyrene panel (3), which are bonded alternatively. The surface layer and the bottom layer are the fine sand gypsum or concrete panels, and according to the requirement, the wall panel can be produced to have three or more layers of composite panels. The wall panel of the present invention has advantages of light weight, easy installation, strong loading capacity, no seam crack, no plaster, and good performance of thermal insulation, sound insulation and fireproof as well as it is suitable for internal wall and external wall. A modular wall panel system 10 for building construction is disclosed. The panel is modular and prefabricated, such that it can be assembled with other panels at a construction site by inserting a tongue 5 in the groove 4 of an adjacent panel, and overlapping the fiberglass mesh 1 which extends from all sides of the panel and fixing them to each other. The panel is formed from at least two layers of fiberglass mesh 1 embedded in a mix 2, and at least one layer of lightweight material such as polystyrene 3 as filler.~~